**COST ESTIMATE FOR PLACEMENT ALTERNATIVES FOR THE GIWW, PORT ISABEL TO CORPUS CHRISTI BAY**

Following is a list detailing the assumptions that were utilized in performing the cost estimates.

**General Assumptions utilized on all estimates:**

1.) All estimates were determined by reach, except for the special cases, which were determined by specific segments.

2.) All dredging and site preparation costs assume a 50-year project life.

3.) Delay times due to barge traffic and adverse weather conditions are based on data from previous dredging projects that have occurred throughout the Laguna Madre portion of the GIWW, vessel traffic records from 1995-2000, and meteorological information for the Lower Laguna Madre. This information was compiled and used to produce a speed table to determine travel speeds for the hopper dredges, tug boats and dump scows.

4.) All dredging volume estimates were based on an analysis of the data provided in DMMP Table 1, which is a compilation of 46.4 years worth of dredging records for the GIWW. This information was provided by the Corps of Engineers (COE) and was used to determine per-cycle discharge quantities, per-cycle dredging areas, shoaling rates, number of dredging episodes, and the sand content of the dredged material. Based on these historical records, an average dig face was determined for each Reach.

5.) The wage rates used in the estimates are based on payroll information from previous dredging projects.

6.) The Corps of Engineers (COE) provided the contractor overhead, profit, and bond rates. The COE also provided the design, construction management and administration, and contingency rates.

7.) Equipment cost factors, area factors, and economic indexes were derived from the U.S. Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule, Region VI, EP 1110-1-8 (Vol. 6), 31 Aug. 01.

8.) The mobilization/demobilization costs for all hydraulic dredges, hopper dredges and smaller clamshell dredges (<10 CY) are based on equipment being mobilized to the project site from as far away as New Orleans (approximately 600 miles). The demobilization costs are based on the equipment being demobilized and stored at Corpus Christi.

9.) The mob/demob costs for the hydraulic dredge estimates were revised for each estimate depending on the length of pipeline and the number of booster pumps necessary to complete the work.

10.) No real estate acquisition costs have been determined for any of the upland alternatives or offshore alternatives where the pipeline crosses private properties.

11.) No environmental constraints or environmental impact costs such as seasonal restrictions or endangered species has been determined.

12.) No costs associated with offshore disposal site permitting has been determined.

**Specific Assumptions utilized on Alternative #1 (Current Method):**

1.) Alternative #1 is the current method of dredging and placement in the GIWW channel.

2.) The estimates for Alternative #1 utilize a 20" Hydraulic Cutter-Suction Dredge.

3.) The material is disposed of at the existing open-water Placement Areas (PA's).

4.) No levee work has been assumed for the existing open-water placement areas that are semi-confined or confined.

5.) Reach 3 is based on disposal at the existing upland sites.

6.) The estimate for Reach 3 assumes shore/levee work associated with the upland sites only during each dredging cycle.

**Specific Assumptions utilized on Alternative #2 (Offshore):**

1.) Alternative #2A1: Offshore – Hopper Dredge w/Turning Basins
   A) Alternative #2A1 assumes a turning basin is located at the north end of each segment in the reach.
   B) Turning basins are 310 foot in diameter, dredged to a depth of -16 feet, and are centered over the GIWW channel.
   C) The turning basin dredge quantities that are within the GIWW channel limits are deducted from the GIWW dredging quantities.
   D) The hopper dredge capacity has been reduced to account for a draft limitation of 10.5 feet.
   E) The dredged material is disposed of at the Port Isabel ODMDS.
   F) The turning basins are dredged by a clamshell dredge prior to each cycle of GIWW dredging and disposed of at the Port Isabel ODMDS.
   G) All costs for dredging the turning basin are included in the site prep costs.
   H) The turning basins are not maintained on a yearly basis but are dredged each cycle.
   I) The shoaling rates for the turning basins are based on the shoaling rates determined for the different reaches from previous dredging records.
   J) Unlimited overflow is permitted from the hopper dredge during loading operations.

2.) Alternative #2A2: Offshore – Hopper Dredge w/o Turning Basins
   A) Alternative #2A2 assumes no turning basins are available for the hopper dredge.
   B) The hopper dredge will travel in a loop and dispose of the dredged material at the Port Mansfield ODMDS and the Port Isabel ODMDS.
   C) The hopper dredge capacity has been reduced to account for a draft limitation of 10.5 feet.
   D) Unlimited overflow is permitted from the hopper dredge during loading operations.

3.) Alternative #2B1: Offshore – Hydraulic/Scow
   A) Alternative #2B1 assumes a pipeline length of 5,000 feet leading to the spider barge.
   B) The effective capacity of the scow is reduced to account for the material type and the large water volume produced by the hydraulic dredge.
   C) The scow draft is limited to 10.5'.
   D) Unlimited overflow is permitted during loading of the dump scows.
   E) Due to the narrow channel widths the spider barge is only able to load from one side.
   F) A resource demand analysis was performed to determine the availability, location, and company of ownership for the U.S. dump scow fleet.
   G) The number of scows was varied from a maximum capacity to a lower capacity to determine the effect on costs when less than optimum scow capacity is available.
   H) Based on the resource demand analysis, the likely number of bidders for the varied scow capacity estimates was determined.
   I) The mobilization costs were increased to allow for transport of the scows from the East Coast.
   J) Based on loading times, only 4,000 CY scows and larger were utilized.

4.) Alternative #2B2: Offshore - Clamshell
   A) Alternative #2B2 assumes a 26 CY clamshell dredge.
   B) The effective capacity of the scow is reduced to account for the material type and limited depth.
   C) The scow draft is limited to 10.5'.
   D) Unlimited overflow is permitted during loading of the dump scows.
   E) A resource demand analysis was performed to determine availability, location, and company of ownership for the U.S. clamshell dredge and dump scow fleet.
   F) The number of scows was varied from a maximum capacity to a lower capacity to determine the effect on costs when less than optimum scow capacity is available.
   G) Based on the resource demand analysis, the likely number of bidders for the varied scow capacity estimates was determined.
   H) The mobilization costs were increased to allow for transport of the scows from the East Coast.
   I) The average size scow utilized for the estimate was a 3,000 CY scow.

5.) Alternative #2C: Offshore – Hydraulic (2 miles offshore)
   A) All estimates for Alternative #2C assume an 8-foot deep channel from the GIWW to Padre Island to allow for the pipeline and booster pump(s).
   B) There are no pipeline corridors for Reaches 2, 3, and most of 1 and 4 due to the Padre Island National Seashore. Only areas of Reach 1 and 4 that were outside the boundaries of the Padre Island National Seashore were estimated.
   C) The pipeline channels are dredged by a 10 CY clamshell dredge prior to each cycle of GIWW dredging and disposed of at the offshore disposal sites.
   D) For Reaches 1, 4, and 5, it is assumed that the pipeline access channel will shoal back to its original condition prior to the next cycle of dredging. For Reach 6, it is assumed that the pipeline access channel will never shoal in any greater than its original condition.

E) It is assumed that all necessary right-of-ways will be obtained for placing the pipeline across Padre Island.
F) It is assumed that culverts or pipeline tunnels will be provided to cross any streets or public right-of-ways on Padre Island.
G) The pipeline will be buried in areas of beach access.
H) The mobilization costs were increased to allow for transport of the scows from the East Coast.
I) Only 2-3,000 CY dump scows were utilized for the site prep estimates.

6.) All estimates for Alternative #2 that utilize dump scows working in the main channel of the GIWW use a 1,600 HP tugboat instead of a workboat. This is required because the dump scow will need to be moved to allow barge and other commercial boat traffic to navigate past the work areas. While the dump scow is alongside the dredge, there is not enough room for commercial traffic to safely navigate.

7.) Larger clamshell dredges (>10 CY) and dump scows were assumed to be mobilized from the East Coast, based on the resource demand analysis that was performed.

8.) The mob/demob costs for the clamshell estimates were revised for each estimate depending on the number of dump scows and tugboats that were needed.

**Specific assumptions utilized on Alternative #3 (Upland)**

1.) The levee quantities for the different upland sites for each segment were combined to get a total levee volume to be constructed for each Reach.

2.) There is no road access to the upland sites. All equipment access will be from channels dredged from the GIWW to shore locations near the upland sites.

3.) A weighted average, based on the dredging volumes for each segment, was used to determine the access channel distances and pipeline distances to the various upland sites.

4.) The size of upland confined sites required are based on levees built to 30-feet in height to contain 50-years worth of dredged material. The levees are constructed utilizing on-site borrow material.

5.) PBS&J provided the locations of the 14 new upland sites. The upland site sizes varied from approximately 30 acres to 510 acres. The approximate total acreage (measured from the outside toe of levee) for all 14 sites was 2,332 acres. Reach 3 uses the existing upland sites for containment. No new upland sites were established.

6.) All site prep estimates for Alternative #3 assume an 8 foot deep channel from the GIWW to the shoreline near the new upland sites and thin-layer sites to allow for equipment access to build the levees and also to provide access for the pipeline and booster pump(s).

7.) The estimate for Reach 3 uses the existing upland disposal sites currently in use. No access channel dredging is necessary.

8.) The site prep estimate for Reach 3 assumes that the existing confined and semi-confined PA's will be completely confined. The external size of the PA is assumed to be the size that is shown on the drawings provided by the COE. Confinement levees were built around areas of the existing PA's that are not currently confined.

9.) The access channels are dredged by a clamshell dredge prior to each cycle of GIWW dredging and disposed of at the offshore disposal sites.

10.) The site prep estimates for the access channels assume a 10 CY clamshell dredge with 2-3,000 CY scows.
   A) The effective capacity of the scow is reduced to account for the material type and limited depth.
   B) The scow draft is limited to 8'.
   C) The mobilization costs were increased to allow for transport of the scows from the East Coast.

11.) The access channels to the upland sites are not maintained on a yearly basis. The dredging of the access channel will occur prior to each dredging cycle (to allow access for equipment to construct levees).

12.) The shoaling rates for the access channels are based on the shoaling rates determined for the different reaches of GIWW.

13.) The mobilization/demobilization costs for the levee construction work for the upland confined and upland thin-layer sites is assumed to be local.

**Specific assumptions utilized on Alternative #4 (Open-Bay)**

1.) The dredged material is disposed of at the existing open-water PA's with the required containment levees.

2.) The levee quantities for the different open-bay confined and open-bay semi-confined PA's for each segment were combined to get a total levee length or volume to be constructed for each Reach.

3.) Reach 3 has not been included in any of the estimates for Alternative #4. Reach 3 was completely confined in Alternative #3.

4.) A weighted average, based on the dredging volumes for each Placement Area, was used to determine the pipeline lengths to the various PA's.

5.) All levee lengths and volumes for Alternative #4 are based on the Conceptual Levee Cross Sections developed by Shiner Moseley and Associates or earthen levee sections using on-site borrow.

6.) Based on water quality requirements, the minimum PA size for 50-years containment was 80-acres or the entire PA if the site was smaller than 80-acres.

7.) At the higher volume placement areas, the fully confined levee sections were built up to the height required to contain 50-years worth of dredged material.

8.) The semi-confined levee sections are built around 3 sides of the placement area and direct the flow of sediments away from the GIWW channel directly after dredging.

9.) The semi-confined levees are not required to contain, dewater and elevate the dredged material, so the final levee height is considerably less than the fully confined levees.

10.) The site prep costs for construction of the conceptual levee sections are based on the preliminary construction costs provided by Shiner Moseley and Associates.

11.) The site prep costs are based on the lowest cost conceptual levee section alternative (i.e. rock dike, geotube, or earthen levees).

12.) The weir costs are based on information provided by the COE.

**Specific assumptions utilized on Alternative #5 (Special Cases)**

1.) Alternative 5A – Offshore (Placement Area's 220 & 221)
   A) Estimate 5A1-4-01 assumes the scows are loaded in the deeper water of the Port Mansfield channel.
   B) The effective capacity of the scow is reduced to account for the material type and the large water volume produced by the hydraulic dredge.
   C) The scow draft is unlimited.
   D) Unlimited overflow is permitted during loading of the dump scows.
   E) Due to the narrow channel widths the spider barge is only able to load from one side, thus causing delays in dredging time due to scow movements.
   F) A resource demand analysis was performed to determine availability, location and company of ownership for the U.S. dump scow fleet.
   G) The number of scows was varied from a maximum capacity to a lower capacity to determine the effect on costs when less than optimum scow capacity is available.
   H) Based on the resource demand analysis, the likely number of bidders for the varied scow capacity estimates was determined.
   I) The mobilization costs were increased to allow for transport of the scows from the East Coast.
   J) Based on loading times, only 4,000 CY scows and larger were utilized.

2.) Estimates 5A1-4-03 and 5B1-5-02 assume a 26 CY clamshell dredge.
   A) The effective capacity of the scow is reduced to account for the material type and limited depth.
   B) The scow draft is limited to 10.5'.
   C) Unlimited overflow is permitted during loading of the dump scows.
   D) A resource demand analysis was performed to determine availability, location and company of ownership for the U.S. clamshell dredge and dump scow fleet.

E) The number of scows was varied from a maximum capacity to a lower capacity to determine the effect on costs when less than optimum scow capacity is available.
F) Based on the resource demand analysis, the likely number of bidders for the varied scow capacity estimates was determined.
G) The mobilization costs were increased to allow for transport of the scows from the East Coast.
H) The average size scow utilized for the estimate was a 3,000 CY scow.

3.) Estimate 5A2-4-01 assumes a turning basin for the hopper dredges is located at the north end of PA 220 and the south end of PA 221.

4.) Estimate 5B2-5-01 assumes one turning basin is located at the north end of PA 233.
A) Turning basins are 310 foot in diameter, dredged to a depth of -16 feet, and are centered over the GIWW channel.
B) The turning basin dredge quantities that are within the GIWW channel limits are deducted from the GIWW dredging quantities.
C) The hopper dredge capacity has been reduced to account for a draft limitation of 10.5 feet.
D) The turning basins are dredged by a clamshell dredge prior to each cycle of GIWW dredging and disposed of at the Port Mansfield or Port Isabel ODMDS.
E) The costs for dredging the turning basin are included in the site prep costs.
F) The turning basins are not maintained on a yearly basis but are dredged prior to each cycle of GIWW dredging.
G) The shoaling rates for the turning basins are based on the shoaling rates determined for the different reaches of the GIWW.
H) Unlimited overflow is permitted from the hopper dredge during loading.

5.) Estimate 5A3-4-01 assumes that the pipeline runs out the Port Mansfield channel and 2 miles offshore. There are no site prep costs for this estimate.

6.) Estimate 5B1-5-01 assumes a pipeline length of 5,000 feet leading to the spider barge.
A) The effective capacity of the scow is reduced to account for the material type and the large water volume produced by the hydraulic dredge.
B) The scow draft is limited to 10.5'.
C) Unlimited overflow is permitted from the dump scows during loading.
D) Due to the narrow channel widths the spider barge is only able to load from one side.
E) A resource demand analysis was performed to determine availability, location and company of ownership for the U.S. dump scow fleet.
F) The number of scows was varied from a maximum capacity to a lower capacity to determine the effect on costs when less than optimum scow capacity is available.
G) Based on the resource demand analysis, the likely number of bidders for the varied scow capacity estimates was determined.
H) The mobilization costs were increased to allow for transport of the scows from the East Coast.
I) Based on loading times, only 4,000 CY scows and larger were utilized.

7.) Estimate 5B3-5-01 assumes an 8-foot deep channel from the GIWW to Padre Island to allow for the pipeline and booster pump(s).
   A) The pipeline channels are dredged by a 10 CY clamshell dredge prior to each cycle of GIWW dredging and disposed of at the Port Isabel ODMDS.
   B) It is assumed that the pipeline access channel will shoal back to its original condition prior to the next cycle of dredging.
   C) It is assumed that all necessary right-of-ways will be obtained for placing the pipeline across Padre Island.
   D) It is assumed that culverts or pipeline tunnels will be provided to cross any streets or public right-of-ways on Padre Island.
   E) The pipeline will be buried in areas of beach access.
   F) The mobilization costs were increased to allow for transport of the scows from the East Coast.
   G) Only 2-3,000 CY dump scows were utilized for the site prep estimates.

8.) Estimates 5C1-4-01 through 5C1-6-03 assume a turning basin is located at the north end of each segment in each reach, except segment 13.
   A) Turning basins are 310 foot in diameter, dredged to a depth of -16 feet, and are centered over the GIWW channel.
   B) The turning basin dredge quantities that are within the GIWW channel limits are deducted from the GIWW dredging quantities.
   C) The hopper dredge capacity has been reduced to account for a draft limitation of 10.5 feet.
   D) The turning basins are dredged by a clamshell dredge prior to each cycle of GIWW dredging and disposed of at the offshore disposal sites.
   E) The costs for dredging the turning basin are included in the site prep costs.
   F) The turning basins are not maintained on a yearly basis but are dredged each cycle.
   G) The shoaling rates for the turning basins are based on the shoaling rates determined for the different reaches of the GIWW.
   H) Unlimited overflow is permitted from the hopper dredge during loading.

9.) Estimates 5C2-5-02 and 5C2-6-03 assume no turning basins are available for the hopper dredge.
   A) The hopper dredge will travel in a loop and dispose of the dredged material at the Port Mansfield ODMDS and the Port Isabel ODMDS.
   B) The hopper dredge capacity has been reduced to account for a draft limitation of 10.5 feet.
   C) Unlimited overflow is permitted from the hopper dredge during loading.

10.) All estimates that utilize dump scows working in the main channel of the GIWW use a 1,600 HP tugboat instead of a workboat. This is required because the dump scow will need to be moved to allow barge and other commercial boat traffic to navigate past the work areas. While the dump scow is alongside the dredge, there is not enough room for commercial traffic to safely navigate.

11.) The mob/demob costs for the clamshell estimates were revised for each estimate depending on the number of dump scows and tugboats that were needed.

12.) Larger clamshell dredges (>10 CY) and dump scows were assumed to be mobilized from the East Coast, based on the resource demand analysis that was performed.